Studies Weekly

TEXAS SCIENCE

Curriculum based on the 5E Model and
100% aligned to the TEKS and ELPS

PROGRAM PREVIEW

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SCAN ME

Note:

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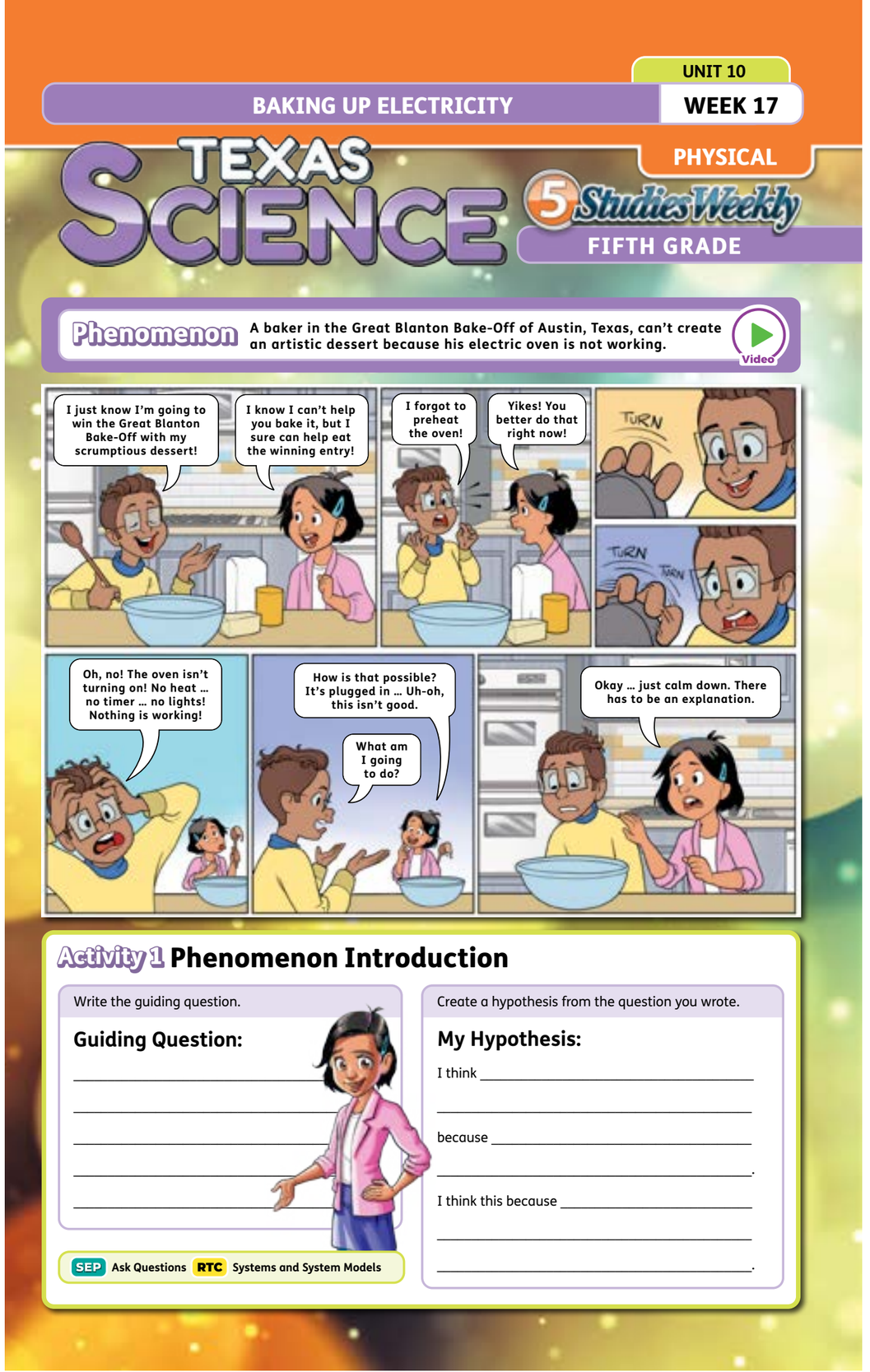
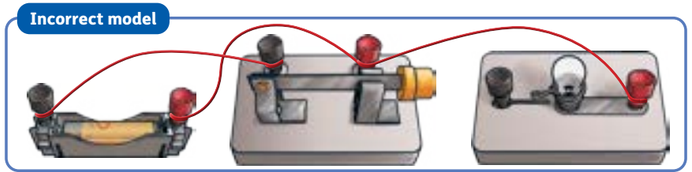


Activity 2 Light It Up

SEP Develop and Use Models RTC Systems and System Models

Directions: Look at the incorrect model. The light bulb will not turn on. Use the incorrect model and the materials in your kit to do your best to create a functioning electrical system that will turn on the light.

Incorrect model



Draw a diagram of your electrical system model.

Based on your model, how do you think the parts of an electrical system work together?

_____

_____

_____

_____

_____

Energy Transforms

When the light comes on, _____ energy is transformed into _____ energy.

Vocabulary:

load: the _____ that is using _____ in an electrical _____

source: the object that provides _____ in a _____ electrical system

Activity 4 Motor in Motion

SEP Plan and Conduct Investigations RTC Systems and System Models

Directions: Use the materials in your kit to create a functioning electrical system with a working motor.

Draw a diagram of your working model.

Energy Transforms

When the motor turns, _____ energy is transformed into _____.

Are there any other energy transformations? If so, what are they?

_____

_____

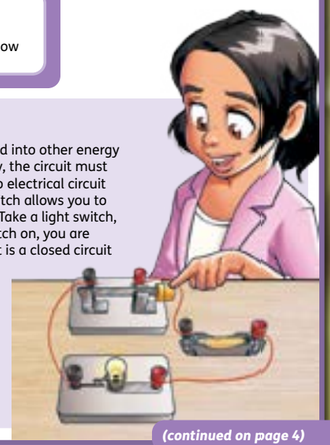
_____

Vocabulary:

circuit: a _____ path around which _____ can flow

Circuit Central

Electricity is everywhere! Each time you turn on a light, play a video game, or watch television, you are using electricity. Without it, our lives would be much harder. We already know that electricity is a form of energy that travels along a closed path and can be transformed into other energy types. The closed path around which electricity can flow is called a **circuit**. A circuit includes a power source, such as a battery or an electrical outlet. It also contains a conductive pathway for electricity to flow, like metal wires coated in plastic. The load is another important part of an electrical circuit. The load is the component of the circuit that uses the electrical power, such as a refrigerator. When we observe evidence of electrical energy, we are seeing the load in action. In a closed circuit, electricity is able to continuously flow: electrical energy is carried along the pathway and transformed into other energy types. To stop the flow of electricity, the circuit must be broken or opened. That's why no electrical circuit is complete without a switch. A switch allows you to open or close the electrical circuit. Take a light switch, for instance. When you flip the switch on, you are connecting the pathway. The result is a closed circuit with a lit bulb. When you flip the switch again, you are breaking the connection. The result is an open circuit with an unlit bulb. The next time you turn on a light, imagine all the parts of the electrical circuit that are working together to make that energy transformation possible!



(continued on page 4)

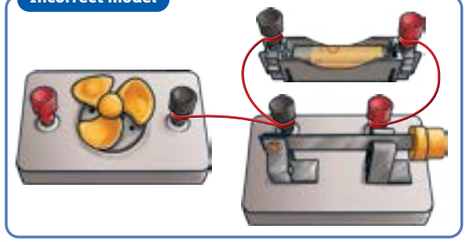
Activity 3 Fan Frenzy

SEP Plan and Conduct Investigations RTC Systems and System Models

Investigation 1

Directions: Look at the incorrect model. The fan will not turn on. Use the incorrect model and the materials in your kit to create a functioning electrical system with a fan that can be turned on or off.

Incorrect model



Draw a diagram of your functioning electrical system model. Label the load and source.

Energy Transforms

When the fan spins, _____ energy is transformed into _____.

_____ energy is also transformed into _____.

Investigation 2

Directions: Use the **Fan Frenzy: Investigation Instructions and Questions** to plan and conduct Investigation 2 with the following chart.

Printable **Fan Frenzy: Investigation Instructions and Questions**

Fan Frenzy: Investigation Chart

Investigation Question:	**My Hypothesis:**
Variables:	**Control:**
Group Plan (What will you test to answer your question?):	
Results:	**Claim:**

Vocabulary:

interdependent: _____ on each _____ for success

switch: a device for _____ or _____ an electrical _____

Reflect & Connect

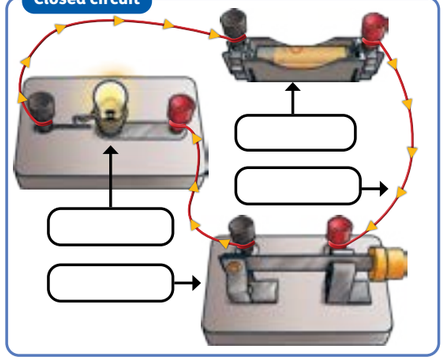
How did this experiment help you make sense of the phenomenon?

Name _____

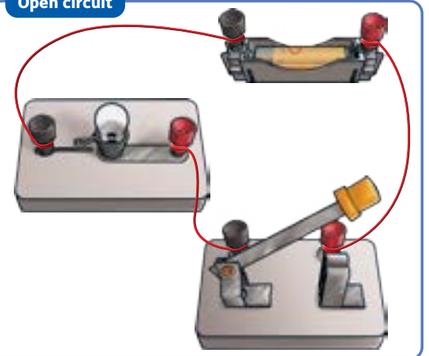
Activity 4 Motor in Motion *(continued from page 2)*

Directions: Label the parts of the closed circuit using the following vocabulary words: load, source, pathway, switch.

Closed circuit



Open circuit



Reflect & Connect

How has your understanding of the phenomenon changed after reading the article? Provide evidence from the model and text to support your answer.

What parts of the phenomenon still need to be explained?

Activity 5 Sound Off

Directions: Use the **Sound Off: Investigation Instructions** to complete the investigation.

SEP Develop and Use Models
RTC Systems and System Models

Printable **Sound Off: Investigation Instructions**

Draw and label your model.

Energy Transforms

When the bell rings, _____ energy is transformed into _____.

Are there any other energy transformations? If so, what are they?

_____

_____

_____

_____

Investigation Question

Which statement represents the correct flow of energy within the circuit you built?

A. When the switch is closed, electrical energy flows from the battery, to the switch, then back to the battery.

B. When the switch is open, electrical energy flows from the battery, to the switch, then back to the battery.

C. When the switch is closed, electrical energy flows from the battery, through the switch and bell, then back to the battery.

D. When the switch is open, electrical energy flows from the battery, through the switch and bell, then back to the battery.

Activity 3 | Fan Frenzy — Explore/Explain | 45 minutes

Materials:

- electrical safety anchor chart (from Activity 1)
- prepared fan investigation kits (one per group; see Teacher Note)

Printable **Fan Frenzy: Investigation Instructions and Questions**

SEP Plan and Conduct Investigations
Develop and Use Models
Collect Evidence

RTC Systems and System Models

ELPS 1E, 2E, 3G

Success Criteria

I can plan and conduct a simple experimental investigation to determine the components in an electrical system.

Teacher Note

Prior to class time, prepare a fan investigation kit for each group. Each kit should contain two AA batteries, two battery holders, one fan holder, one mini-fan, two black wires, and one red wire.

Lesson Guide

Student-Driven Inquiry

1. **Ask:** What did we learn from yesterday's activity? **(We learned that electrical systems must have certain parts or components to function properly.)**
2. Have students look back at the Student-Driven Question Board.
   a. Direct students to identify a question relating to "How does an electrical system work?"
3. Explain to students that to answer this question, we need to know the answer to another question: "How do the components of a functioning electrical system work together?" So, this will be today's investigation question.
   a. Add this investigation question to the Student-Driven Question Board.
4. Lay out the materials in one group investigation kit and direct students to observe them.
5. **Discuss:** How could you devise a plan to see how these parts work together to create a functional electrical system? **(We could put them together so that the fan functions and see what happens when certain components are removed.)**
   a. If students struggle to come up with ideas, provide the following model:
      i. ***Think-Aloud Model:*** *If I want to know how the parts of the system work together, then I will first need to put them together in a way that works. Then, I can remove pieces of the system and see what happens. This will show me how they work together to create a functioning electrical system.*
6. Explain to students that they will be working together to construct a model and plan and conduct a simple experimental investigation to answer the investigation question "How do the components of a functioning electrical system work together?
7. Before students start their investigations, remind them again of the Texas Safety Standards on the electrical safety anchor chart from Activity 1.

Collaborative Learning

1. Place students into groups of four.
2. Provide each group with a fan investigation kit and a copy of the **Fan Frenzy: Investigation Instructions and Questions** printable.

3. Direct students to follow the directions in their student editions and on the **Fan Frenzy: Investigation Instructions and Questions** printable to complete the activity.
   a. In the activity, students will make changes to an incorrect model in order to build a functioning electrical system with a fan that can turn on or off.
   b. Explain to students that they will complete both Investigations 1 and 2.

⚠ **Misconception:** An electrical system can work with one missing component or with all parts connected in some way. Make sure students understand that all of the components must be connected in a closed path that allows for electricity to flow continuously through the system.

   c. As you circulate, observe students' discussions and take anecdotal data monitoring their increasing specificity and detail as they work through ideas. [ELPS 3H]
4. If students need additional support during Investigation 1, these questions can be used to help scaffold:
   - What do you notice about the incorrect model?
   - Does your kit have the same parts as the incorrect model?
   - What could you try first?
   - If that doesn't work, what could you do next?
5. If students need additional support during Investigation 2, provide the following model:
   a. ***Think-Aloud Model:*** *In a simple experimental investigation, I use a control to test my hypothesis, so in this case, the control would be the working model. I know that I need to test some variables to see the effects on my system model. What variables could I test? I could disconnect a wire, remove the battery, etc.*
6. Encourage students to share their thoughts and ideas during the investigations.
7. This is an opportunity for students to participate in extended discussions on a variety of grade-level topics. [ELPS 3G]

Discussion

1. After students have completed their investigations, gather them to share the results:
   - What parts were needed for your working electrical system in Investigation 1? **(battery, switch, fan, wires)**
   - In Investigation 2, what were some of the ways you tested your hypothesis? **(Answers may vary but could include: We disconnected a wire; we removed the fan; etc.)**
   - What were the results of your simple experimental investigation? **(When any part of the system was disconnected, the entire system would not work.)**
   - What does this tell you about how the parts of a functioning electrical system work together? **(They all work together. Without all parts of the system being connected, the system will not work. They depend on each other for electricity to flow and transform.)**

Printable **Baking Up Electricity: Flash Cards**
Baking Up Electricity: Word Wall Cards

Vocabulary
interdependent: dependent on each other for success
switch: a device for making or breaking an electrical connection

Vocabulary

2. Have students describe or name the parts of the electrical system that they already know (load and source).
3. Hold up the switch.
   a. Call on students to share their ideas about what this component may be and provide reasoning.
4. ***Say:*** *In science, a device for making or breaking an electrical connection is called a* ***switch****.*

Multi-Meaning Word
Address "switch" as having multiple meanings, and clarify the definition they'll use in the unit:
- **a device for making or breaking an electrical connection**
- **not:** the act of replacing one item with another
- **not:** a thin, flexible shoot from a tree

5. In pairs, have students use the word in a new sentence to describe/show how "switch" is being used in the unit.
6. Have students complete the "Vocabulary" section for "switch" in their student editions.
7. ***Say:*** *In your simple experiment, you found that all parts of a system depend on each other for the system to function properly.*
8. Write the vocabulary word "interdependent" on the board.
9. Explain how the word "interdependent" can be separated into a prefix and a base word. Read the word together to show how its parts fit together.
   a. Monitor students' ability to use linguistic support to enhance and confirm understanding of increasingly complex language. [ELPS 2E]
10. **Ask:** How did the parts of the system you observed in this activity depend on one another? **(If even one part wasn't connected or working properly, then the entire system didn't work.)**
11. ***Say:*** *In science, when parts of a system depend on one another for success, we say they are* ***interdependent****.*
12. Have students complete the "Vocabulary" section for "interdependent" in their student editions.
13. Have students write a sentence in their science notebooks describing how parts of an electrical system are dependent on one another.
    a. Have students use the newly acquired vocabulary words "load," "source," "switch," and "interdependent" when constructing their sentences. **(In an electrical system, the load, source, pathway, and closed switch must be connected in a closed path for the system to work because the parts are interdependent.)**
       i. This is an opportunity for students to internalize new academic language by using it in meaningful ways in writing activities to build concept and language attainment. [ELPS 1E]

Independent Work

Students will complete the "Investigation Questions" in their student editions and the "Reflect and Connect" section in their science notebooks.

Reflect and Connect

Students will share their "Reflect and Connect" responses from their science notebooks.

Optional

Differentiation

Developing

Allow students to orally share their responses from the Independent Work section of the lesson with a partner before writing in the student edition to give them the opportunity to practice their responses.

Advanced

Have students write a small paragraph describing how each component is dependent on the other parts and how it contributes to the energy transformation and overall function of the system.

Formative Assessment	Evidence	Student Edition Response
	Use students' plans and responses in the "Investigation Questions" section from Investigation 2 to check for proficiency of the success criteria.	

Activity 4 | Motor in Motion — Explore/Explain | 45 minutes

Materials:

- electrical safety anchor chart (from Activity 1)
- prepared motor investigation kits (one per group; see Teacher Note)

SEP **Plan and Conduct Investigations**
Develop and Use Models
Collect Evidence

RTC **Systems and System Models**
Energy and Matter

ELPS **4F**

Success Criteria

I can identify and model the components of a functioning electrical system.

Teacher Note

Prior to class time, prepare a motor investigation kit for each group. Each kit should contain one AA battery, one battery holder, one mini-motor, one switch, one black wire, and two red wires.

Lesson Guide

Student-Driven Inquiry

1. ***Say:*** *Electricity is a huge part of our everyday lives. How would your life be different without electricity?* **(Answers may vary but could include: I couldn't play video games; I couldn't watch television; I couldn't listen to the radio; etc.)**
   a. Tip: Some students may have experienced having the electricity turned off in their homes. Be sensitive to this.
2. Have students look back at the Student-Driven Question Board.
3. **Ask:** Which question would help us identify the parts of an electrical system and the name of that system?
   a. Highlight answers relating to "What are the parts/components of an electrical system?"
4. ***Say:*** *Today, as you construct your model to create a working electrical system, be sure to think about the functions of all the parts in the system and their interdependence.*
5. Lay out the materials in one group investigation kit and direct students to observe them.
6. Have students discuss their predictions about the following questions:
   - What purpose do you think the battery has in the electrical system? **(Answers may vary. Example: The battery is the power source. It provides the chemical energy needed for energy transformation.)**

⚠ **Misconception:** Batteries store and release electricity. Make sure students understand that batteries store chemical energy and convert it into electrical energy.

   - What purpose do you think the motor has in the electrical system? **(Answers may vary. Example: The motor uses the electricity that is produced to move.)**
   - What purpose do you think the wires have in the electrical system? **(Answers may vary. Example: The wires create a path for electrical energy to travel on.)**
7. Before students start their investigations, remind them again of the Texas Safety Standards on the electrical safety anchor chart from Activity 1.

Printable **Baking Up Electricity: Flash Cards**
Baking Up Electricity: Word Wall Cards

Vocabulary
circuit: a closed path around which electricity can flow

Collaborative Learning

1. Place students in groups of four.
2. Provide each group with a motor investigation kit.
3. Direct students to follow the directions in their student editions to complete the activity.
   a. In the activity, students will build a functioning electrical system with a working motor and learn that electrical energy in a complete circuit can be transformed into motion.
   b. As you circulate, observe students' discussions and take anecdotal data monitoring their progression toward mastery of the success criteria through identifying the components of the system and how to use them to model the electrical circuit.
4. If students struggle to recall energy types for the "Energy Transforms" section of the student edition, model the words and prompt students to speak using grade-level content vocabulary to build academic language proficiency.

Vocabulary

1. Have students recall all of the components of an electrical system (load, source, pathway, and switch).
2. Point out all of the components together on the visual in the student edition.
3. ***Say:*** *All of the components work together in an electrical system. This system has a special name.*
   a. Call on students to share their ideas about the name of the system.
4. ***Say:*** *In science, all of the components of an electrical system make up a circuit. A* ***circuit*** *is a closed path around which electricity can flow.*

Multi-Meaning Word
Address "circuit" as having multiple meanings, and clarify the definition they'll use in the unit:

- **a closed path around which electricity can flow**
- **not:** an established set of events

5. Have students write a new sentence with the word in their science notebooks to describe/show how "circuit" is being used in the unit.
6. Have students complete the "Vocabulary" section for "circuit" in their student editions.

Discussion

1. Based on what you know about closed pathways, how can a circuit be closed? **(Answers may vary. Example: In a closed pathway, there are no breaks in the connection. Therefore, in a closed circuit, the wires must be connected so that there is no break.)**
2. What would be the result of a closed circuit with a light bulb as the load? **(Correct answer: The light bulb would turn on. Partially correct answer: The wires would be connected without a break. Incorrect answer: The light bulb would turn off/not turn on.)**

ELAR **5.7C:** Use text evidence to support an appropriate response.

Reading to Learn

1. Have students read the article in their student editions independently.
2. Encourage students to use the visual in the article and contextual support from teachers as needed to enhance and confirm understanding. [ELPS 4F]

Reflect and Connect

1. Have students complete the "Reflect and Connect" section independently in their science notebooks.
2. Allow students to share their responses with the class.
   a. For the first question, make sure that students present the evidence from the text that they used to support their responses.

Optional
Differentiation

Printable **Baking Up Electricity: Lower Lexile® Measure Articles**

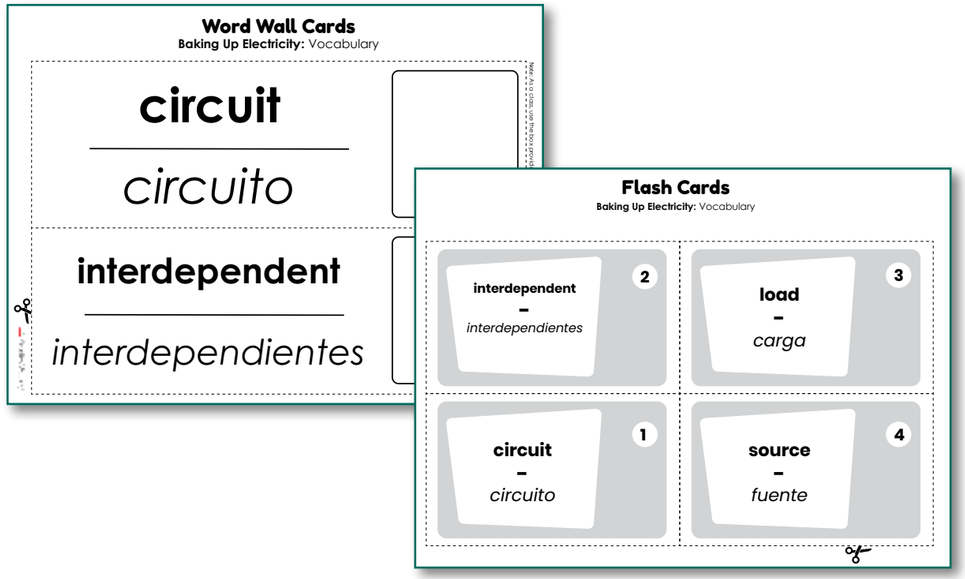
Developing

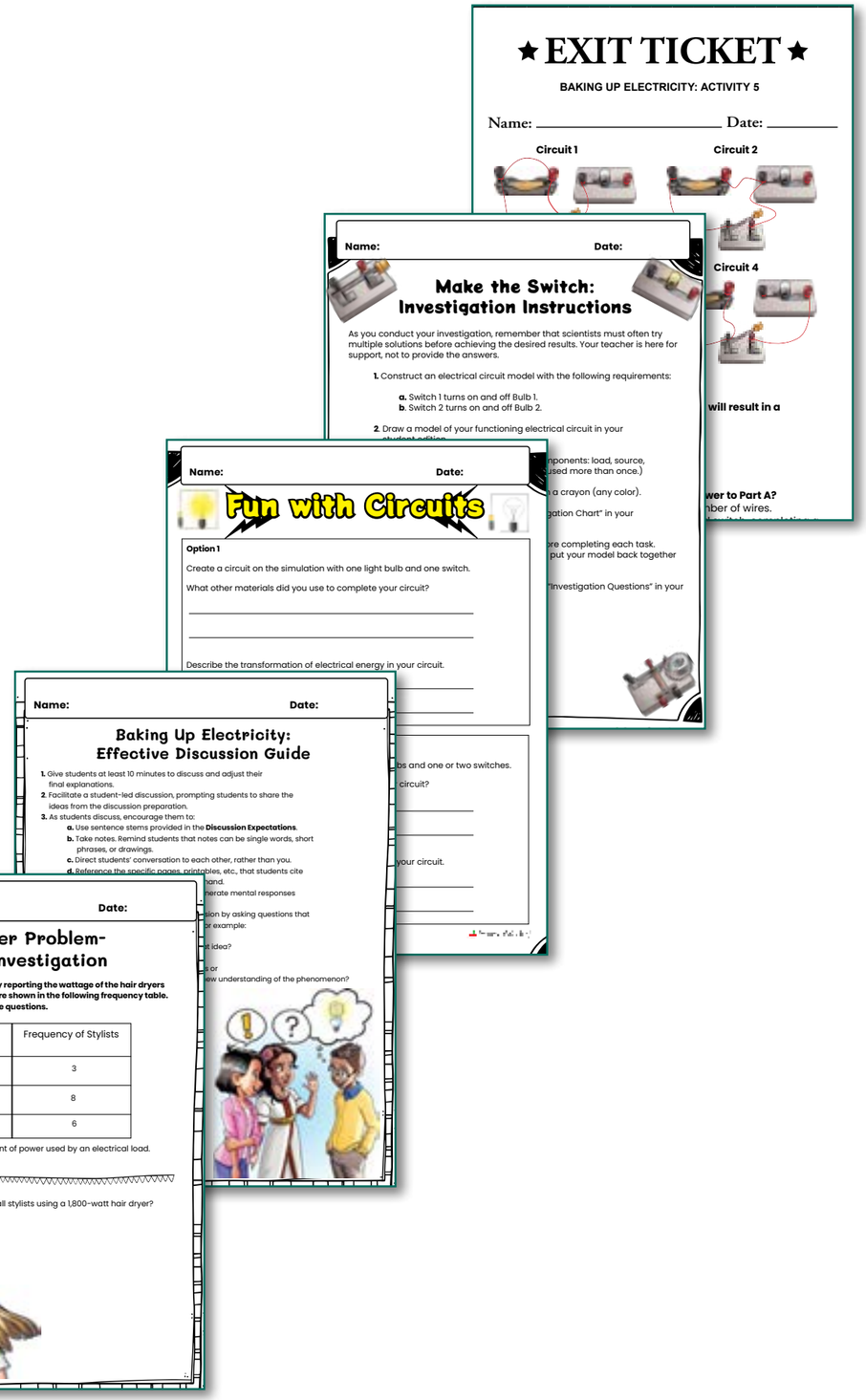
- Students can read the lower Lexile® measure version of the article "Circuit Central" (Lexile® measure: 740L; word count: 268) in the **Baking Up Electricity: Lower Lexile® Measure Articles** printable.
- If students struggle to read the article independently, have them read it in a small group with teacher support.

Advanced

Have students write a paragraph about circuits. The paragraph should include the vocabulary words "load," "source," "switch," "pathway," and "circuit."

Formative Assessment	Evidence	Student Edition Response and Writing Sample
	Use students' diagrams and "Reflect and Connect" responses to check for proficiency of the success criteria.	





★ EXIT TICKET ★

BAKING UP ELECTRICITY: ACTIVITY 5

Name: _____ Date: _____

Circuit 1

Circuit 2

Circuit 4

Name: Date:

Make the Switch: Investigation Instructions

As you conduct your investigation, remember that scientists must often try multiple solutions before achieving the desired results. Your teacher is here for support, not to provide the answers.

1. Construct an electrical circuit model with the following requirements:

   a. Switch 1 turns on and off Bulb 1.
   b. Switch 2 turns on and off Bulb 2.

2. Draw a model of your functioning electrical circuit in your

will result in a

wer to Part A?
nber of wires.

Name: Date:

Fun with Circuits

Option 1

Create a circuit on the simulation with one light bulb and one switch.

What other materials did you use to complete your circuit?

Describe the transformation of electrical energy in your circuit.

Name: Date:

Baking Up Electricity: Effective Discussion Guide

1. Give students at least 10 minutes to discuss and adjust their final explanations.
2. Facilitate a student-led discussion, prompting students to share the ideas from the discussion preparation.
3. As students discuss, encourage them to:
   a. Use sentence stems provided in the **Discussion Expectations**.
   b. Take notes. Remind students that notes can be single words, short phrases, or drawings.
   c. Direct students' conversation to each other, rather than you.
   d. Reference the specific pages, printables, etc., that students cite

Name: Date:

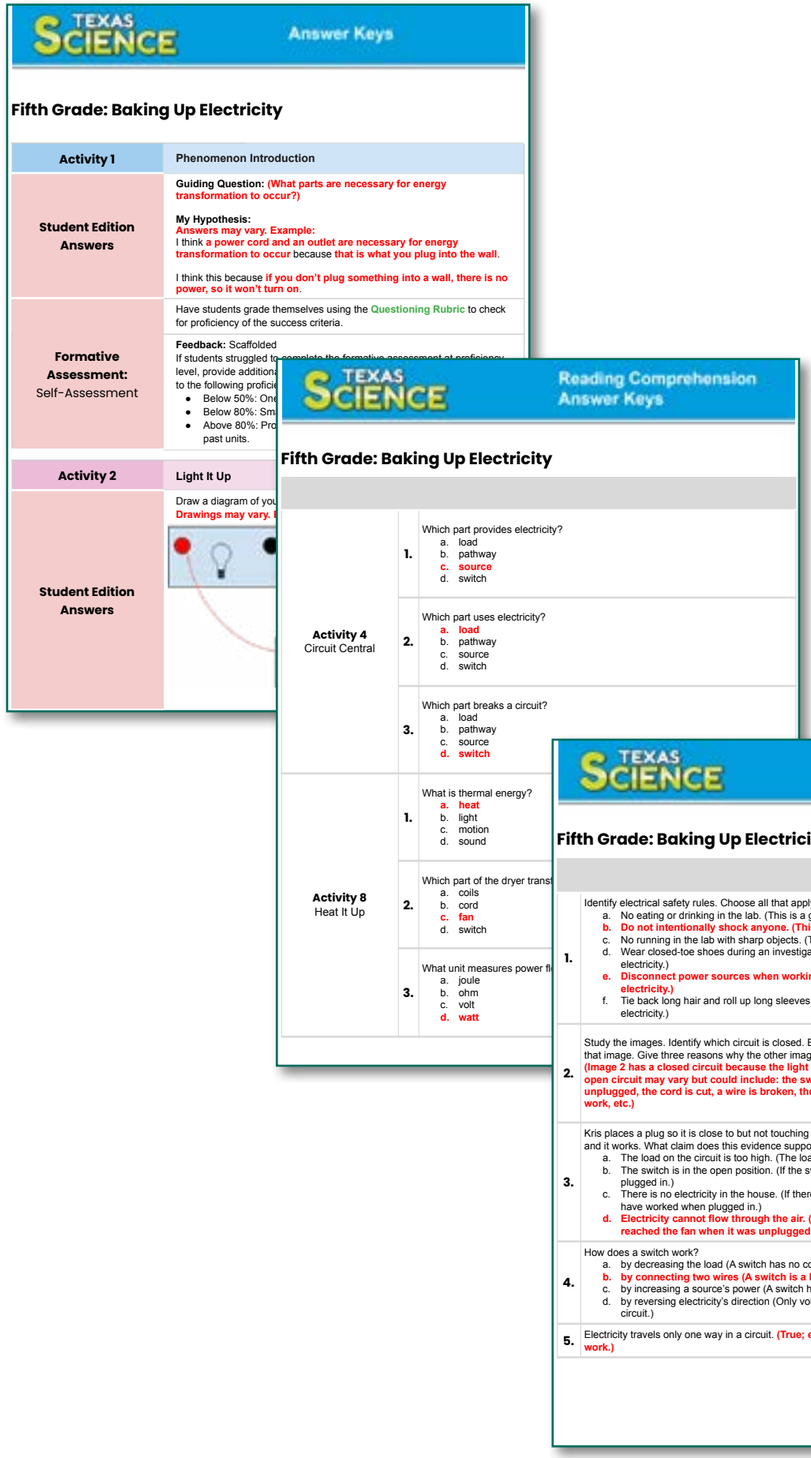
Hair Dryer Problem-Solving Investigation

Hair stylists in Anytown took a survey reporting the wattage of the hair dryers they use in their salons. The results are shown in the following frequency table. Use the frequency table to answer the questions.

Hair Dryer Wattage*	Frequency of Stylists
1,800	3
1,875	8
2,000	6

*Wattage measures the amount of power used by an electrical load.

What was the combined wattage for all stylists using a 1,800-watt hair dryer?



TEXAS SCIENCE Answer Keys

Fifth Grade: Baking Up Electricity

Activity 1	**Phenomenon Introduction**
Student Edition Answers	**Guiding Question:** (What parts are necessary for energy transformation to occur?) **My Hypothesis:** **Answers may vary. Example:** I think a power cord and an outlet are necessary for energy transformation to occur because that is what you plug into the wall. I think this because if you don't plug something into a wall, there is no power, so it won't turn on.
Formative Assessment: Self-Assessment	Have students grade themselves using the Questioning Rubric to check for proficiency of the success criteria. **Feedback:** Scaffolded If students struggled to complete the formative assessment at proficiency level, provide additional to the following proficie • Below 50%: On • Below 80%: Sm • Above 80%: Pro past units.
Activity 2	**Light It Up**
Student Edition Answers	Draw a diagram of you Drawings may vary.

TEXAS SCIENCE Reading Comprehension Answer Keys

Fifth Grade: Baking Up Electricity

Activity 4 Circuit Central	**1.**	Which part provides electricity? a. load b. pathway **c. source** d. switch
	2.	Which part uses electricity? **a. load** b. pathway c. source d. switch
	3.	Which part breaks a circuit? a. load b. pathway c. source **d. switch**
Activity 8 Heat It Up	**1.**	What is thermal energy? **a. heat** b. light c. motion d. sound
	2.	Which part of the dryer transf a. coils b. cord **c. fan** d. switch
	3.	What unit measures power fl a. joule b. ohm c. volt **d. watt**

TEXAS SCIENCE Unit Assessment Answer Keys

Fifth Grade: Baking Up Electricity

1.	Identify electrical safety rules. Choose all that apply. a. No eating or drinking in the lab. (This is a general lab rule, not specific to electricity.) **b. Do not intentionally shock anyone. (This is a TX safety standard for electricity.)** c. No running in the lab with sharp objects. (This is a general lab rule, not specific to electricity.) d. Wear closed-toe shoes during an investigation. (This is a general lab rule, not specific to electricity.) **e. Disconnect power sources when working on circuits. (This is a TX safety standard for electricity.)** f. Tie back long hair and roll up long sleeves in the lab. (This is a general lab rule, not specific to electricity.)
2.	Study the images. Identify which circuit is closed. Explain why you chose that image. Give three reasons why the other image has an open circuit. **(Image 2 has a closed circuit because the light is on. Answers for the open circuit may vary but could include: the switch is open, it is unplugged, the cord is cut, a wire is broken, the light bulb does not work, etc.)**
3.	Kris places a plug so it is close to but not touching an outlet. The fan does not work. Kris plugs in the fan and it works. What claim does this evidence support? a. The load on the circuit is too high. (The load does not change between plugged and unplugged.) b. The switch is in the open position. (If the switch was open, the fan would not work when it was plugged in.) c. There is no electricity in the house. (If there was no electricity in the house, the fan would still not have worked when plugged in.) **d. Electricity cannot flow through the air. (If electricity could flow through the air, it would have reached the fan when it was unplugged.)**
4.	How does a switch work? a. by decreasing the load (A switch has no connection to the circuit's load.) **b. by connecting two wires (A switch is a bridge between two wires that completes the path.)** c. by increasing a source's power (A switch has no connection to the circuit's source.) d. by reversing electricity's direction (Only voltage converters can reverse the flow of electricity in a circuit.)
5.	Electricity travels only one way in a circuit. **(True; electrons can only travel one way for a circuit to work.)**

Wire Dancer Instructions

INSTRUCTIONS:

1) Look at the illustration.
2) Bend the copper wire, using the illustration as a guide.
3) Place the wire on the battery as indicated on the illustration.

TIPS:

1) Monitor the batteries for heat. If the dancer starts going too fast, the battery can get quite hot. If the battery gets overheated, remove it and get a new one.
2) Keep the form of your dancer as symmetrical as possible. They have to be balanced, or they will spin off the battery.
3) The illustration is simply a guide. You will have to fine-tune the wire dancer by hand.
4) Remove the magnets immediately after using the wire dancer or they will drain the battery.
5) If the dancer isn't working, try the following:
   -Turn your magnets over and reverse the polarity.
   - Replace the battery.
   - Make sure the bottom section of wire encircles the magnets.
   - Make sure the wire is free to move around the battery and magnets.

Name: **Date:**

Scribble Bots

Use the following materials to build a scribble bot. Be sure to follow the instructions.

Materials:

- 1.3-ounce cylindrical chip can (1)
- AA battery (1)
- clear tape (as needed)
- felt-tip pens or markers (3)
- hot glue gun stick or pink eraser (1)
- lead wires (2)
- small motor (1)
- thick rubber band (2 in x ½ ; 1)
- white butcher paper (1 sheet)

Instructions:

the battery and tape it to the top of

top of the container. Place it close to

and battery. Use the rubber band to

k eraser to the motor. Test to make

or markers to the sides of the

le. Remove the lids from the pens or
nove!

Name: **Date:**

The Magnetism and Electricity Connection

Charades time! Find two or three partners to form a small group. Then, each of you should take a turn miming (acting out without sound) microwaving a cup of hot chocolate, taking it out, and taking a sip.

How did your team members act out touching the hot cup? What about taking a sip? Did anyone pretend to react to the heat from the cup or the hot chocolate? The instant you touch a hot cup or take a sip of a hot drink, heat energy transfers to your fingers or your mouth. The Latin root "trans" means through or across. To transfer means to move something to a new location. If you've ever touched a seat belt buckle in a hot car, that's heat transfer, too! In that case, the heat goes from the metal surface of the buckle to your skin.

Not only does energy transfer between objects, but it also transforms. To transform means to change in shape or form. Stand up. Believe it or not, you just performed an energy transformation. Your body just transformed chemical energy from food to make your body move. If you were to repeat this exercise for five minutes, you'd start to feel hot. Remember, scientists refer to heat as the waste that is created when one type of energy is converted into another.

Energy transfer and transformation is happening all around us. Follow each activity's instructions below to investigate how energy transfers and transforms.